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(72) Inventor; and

(75) Inventor/Applicant (for US only): **PESHKIN, Michael**,  
A. [US/US]; 927 Asbury Avenue, Evanston, IL 60202  
(US).

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(74) Agent: **LEE, George, I.**; McDonnell Boehnen Hulbert &  
Berghoff, Suite 3200, 300 South Wacker Drive, Chicago,  
IL 60606 (US).

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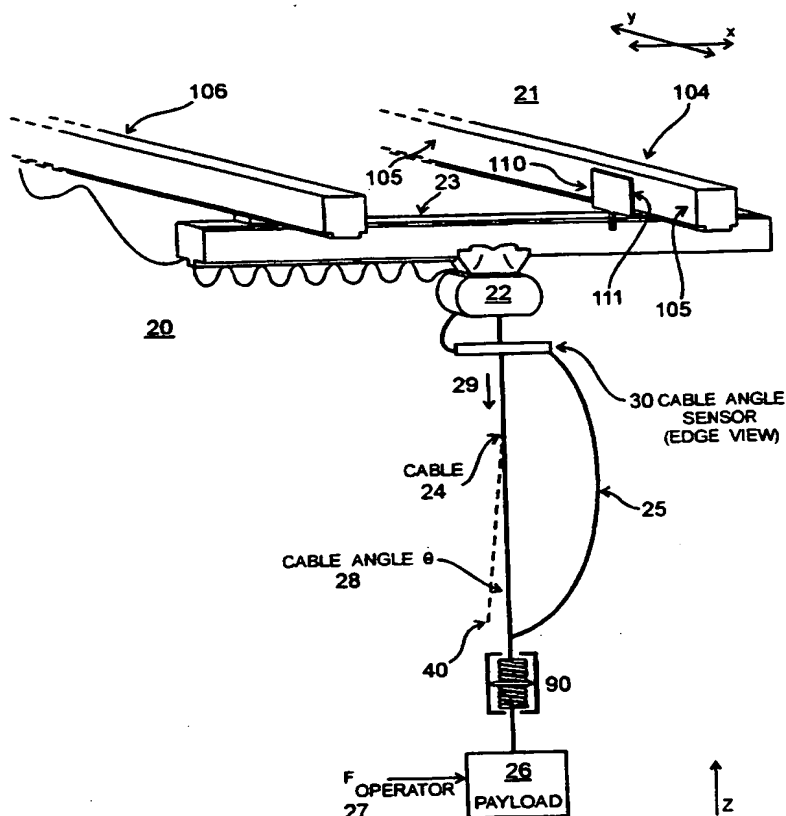
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(71) Applicant (for all designated States except US): **NORTH-  
WESTERN UNIVERSITY [US/US]**; 633 Clark Street,  
Evanston, IL 60208 (US).

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(54) Title: **NON-CONTACTING SENSORS**



(57) Abstract: A system and method for measuring the deflection angle of a cable from an initial position is disclosed. The cable is energized with an alternating electric current that creates a magnetic field associated with the cable. Pickup coils are positioned adjacent to the cable and oriented to measure the deflection of the cable in different directions. In an initial position, the magnetic field of the cable is parallel with and does not interact with pickup coils. In the deflected position, the magnetic field of the cable intersects and interacts with the pickup coils. The interaction of the magnetic field with the pickup coils induces a voltage in the pickup coils that indicates the angle of deflection of the cable. Also disclosed are methods and devices for providing a more durable and rugged sensor capable of detecting forces along a single axis. Still other embodiments disclose methods and devices for determining the orientation of a surface or object with respect to another surface.

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/03144

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G01B7/312 B66C13/06 G01L1/14 G01D5/243 G01D5/20  
G01D5/22

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01B B66C G01L B66D G01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A Y	US 5 350 075 A (KAHLMAN STURE) 27 September 1994 (1994-09-27) abstract; figures 3-8 column 2, line 29 -column 4, line 57 ---	25 1-24 33,49,50
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X A	GB 641 674 A (URMENYI, LASZLO) 16 August 1950 (1950-08-16) page 3, line 37 -page 5, line 17; figures 1-3  --- -/--	1,2, 10-12 3-9, 13-25



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

### \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
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- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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- \*&\* document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Helm, B

# INTERNATIONAL SEARCH REPORT

International Application No.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 17 56 441 A (DEMAG AG) 30 April 1970 (1970-04-30) the whole document ---	1-25
Y	DE 32 05 705 A (TRAENKLER HANS ROLF PROF DR IN; SCHILLINGER JAKOB DIPL ING) 25 August 1983 (1983-08-25) the whole document ---	25, 27, 33, 50
A	---	26, 28-32, 51, 52
Y	DE 22 11 359 A (HONSBURG & CO KG) 13 September 1973 (1973-09-13) the whole document ---	25, 27, 33, 50
A	---	26, 28-32, 51, 52
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A	---	26, 28-32
X	EP 0 305 591 A (WEIDMUELLER C A GMBH CO) 8 March 1989 (1989-03-08) abstract; figures 1-4 column 6, line 56 -column 8, line 37 ---	34-36
Y	---	49, 50
A	---	37-48
X	US 4 906 924 A (ZANNIS JAMES) 6 March 1990 (1990-03-06) figure 13 abstract -----	34, 35
Y	-----	49, 50
A	-----	36-48

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 00/03144

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-25

An apparatus for measuring the deflection of a support member, wherein a magnetic field is supplied to the support member and a plurality of coils are positioned adjacent to the support member to detect that field.

2. Claims: 25-33, 50-52

A user manipulatable handle measuring the deflection of a spring in order to determine the vertical forces applied to the handle.

3. Claims: 34-49

A parallel orientation sensor for detecting a deviation in the orientation of a sensor pad with respect to a reference surface.



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/03144

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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